

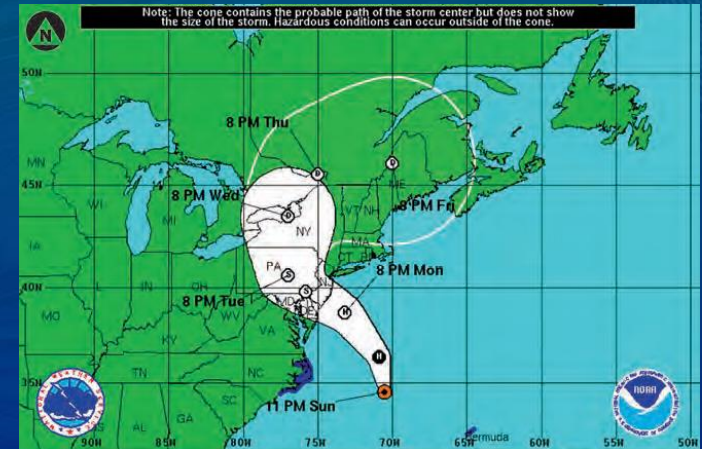


NIST Special Publication 1190

Community Resilience Planning Guide for Buildings and Infrastructure Systems

Why Community Resilience?

- All communities face potential disruption from natural, technological, and human-caused hazards.
- Disasters take a high toll in lives, livelihoods, and quality of life that can be reduced by better managing disaster risks.
- Planning and implementing *prioritized* measures can strengthen resilience and improve a community's ability to continue or restore vital services in a more timely way – and to build back *better*.
- The built environment exists to serve a social function (e.g., a hospital provides healthcare services). Therefore, social and economic needs and functions should drive the goals for performance of buildings and physical infrastructure.
- New tools and guidance are needed to measure resilience and plan and implement measures to enhance resilience.



NIST Community Resilience Program



*Stakeholder Engagement component is called out in the President's Climate Action Plan



What is Resilience?

- *“the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies”.* (Presidential Policy Directive (PPD) 8)
- *“the ability to prepare for and adapt to changing conditions and to withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents.”* (PPD 21)
- Resilience addresses all activities through recovery:
 - Prevention, Protection, Mitigation, Response, and Recovery
 - Risk assessments address the potential consequences of hazard's impact on existing construction and identify vulnerabilities
 - Emergency management addresses immediate response, with a focus on life safety

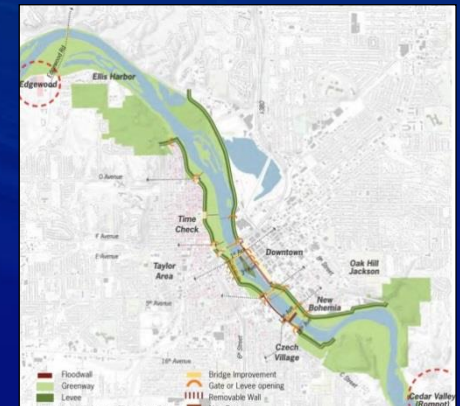


Why Resilience Planning?

- All communities face potential disruption from natural, technological, and human-caused hazards.
- Disasters take a high toll in lives, livelihoods, and quality of life – the impact can be reduced by better managing risks.
- Planning and implementing *prioritized* measures can improve a community's ability to restore vital services in a timely way – and to build back *better*.
- The built environment exists to serve social functions (e.g., a hospital provides healthcare). Therefore, social functions should drive the performance goals of buildings and physical infrastructure.
- The NIST Community Resilience Planning Guide provides a *practical, flexible* methodology to set priorities and allocate resources to reduce risks by improving their resilience.



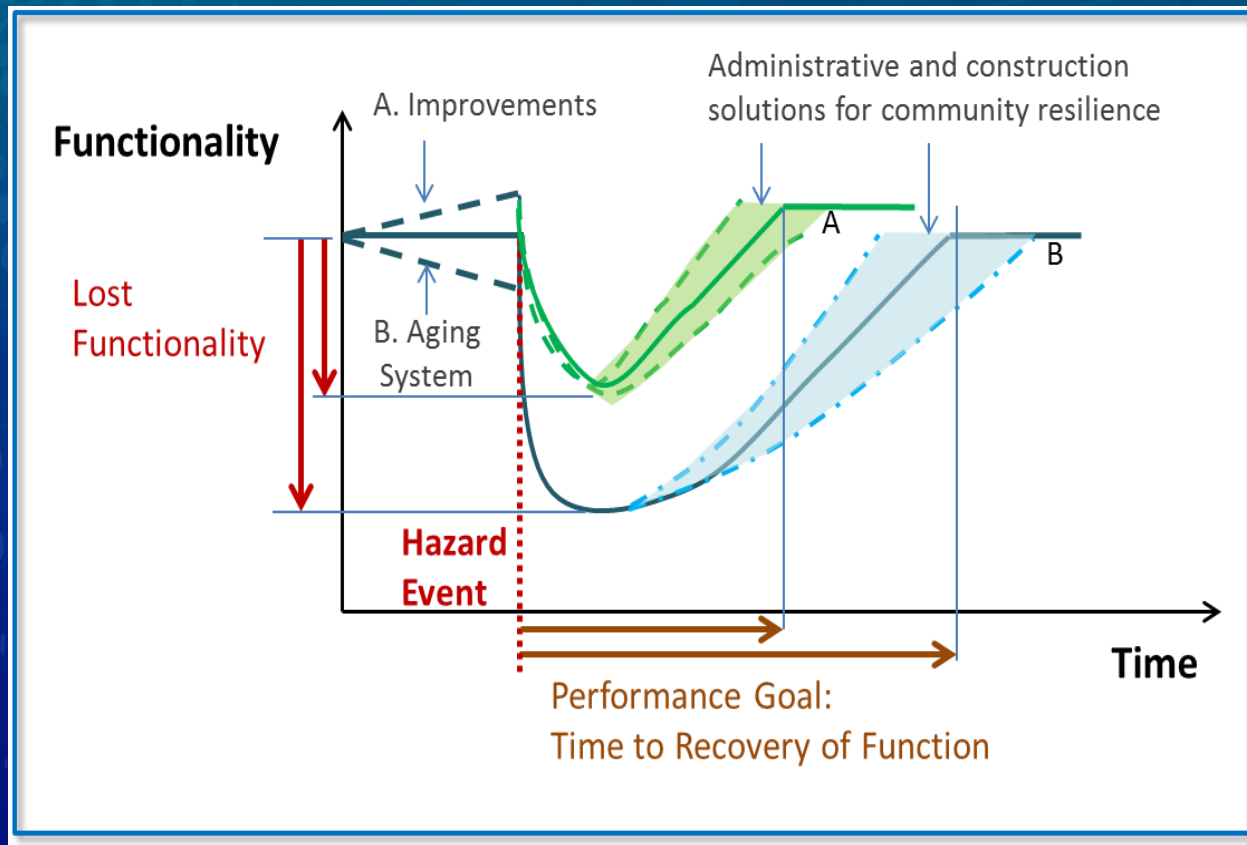
Downtown Cedar Rapids, Iowa, during the 2008 floods



Recovery and Reinvestment Plan



Key Concept: Recovery of Function



Resilience can be expressed simply in terms of system functionality and the time to recover functionality following a disruptive hazard event.



Guide Development Process



Guide Focus: Resilience Planning

- The built environment exists to serve a social function (e.g., a hospital provides healthcare). Therefore, social and economic needs and functions should drive the goals for performance of buildings and physical infrastructure.
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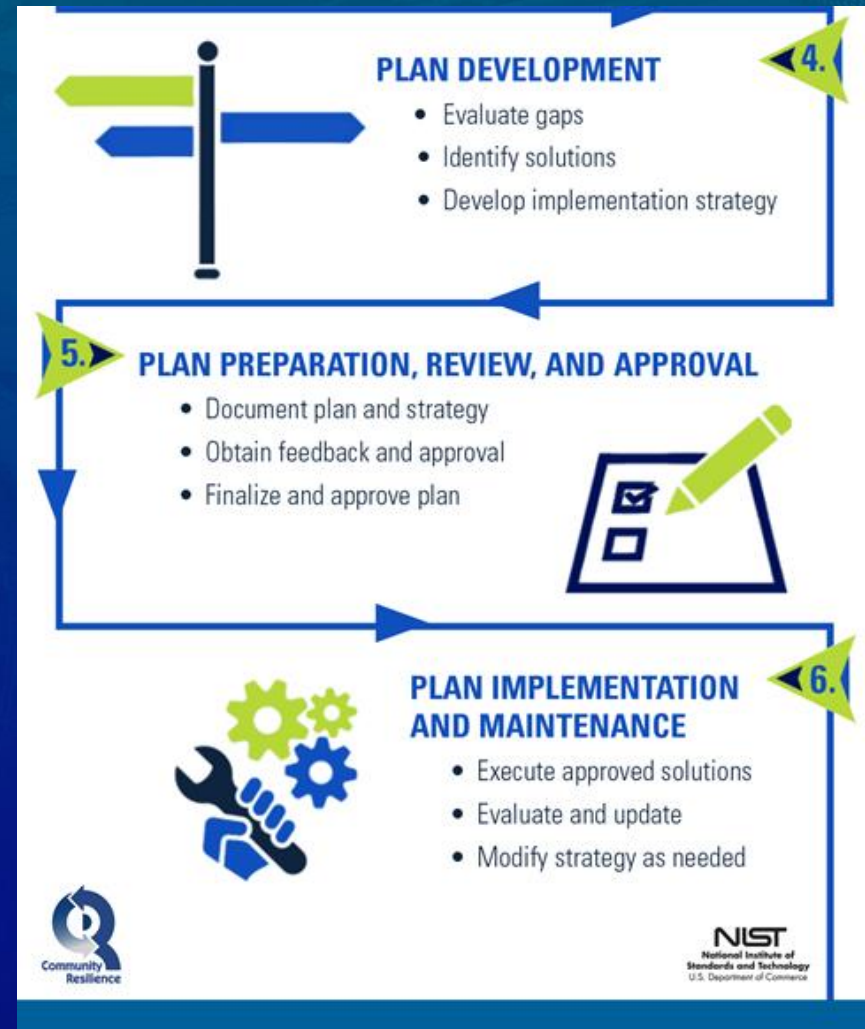
Guide Overview

- The Guide helps communities:
 - Organize effectively to address resilience risks, goals, and priorities.
 - Determine customized long-term resilience goals.
 - Develop short- and long-term plans for buildings and infrastructure systems to achieve resilience goals.
 - Prioritize improvements to the built environment based on their role in supporting social institutions and economic functions during recovery.
 - Address infrastructure dependencies and cascading effects of system failures.

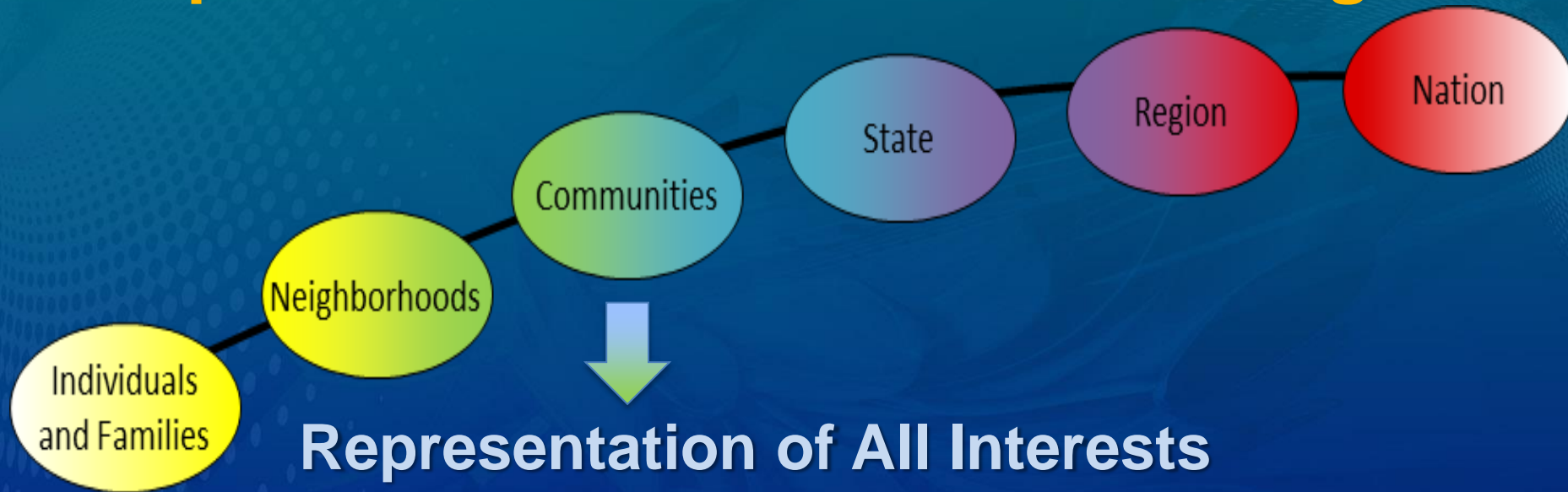


Planning Steps for Community Resilience

SIX-STEP GUIDE TO PLANNING FOR COMMUNITY RESILIENCE



Step 1. Form a Collaborative Planning Team



Public

- Elected Officials
- Local Government
- Community Members

Private

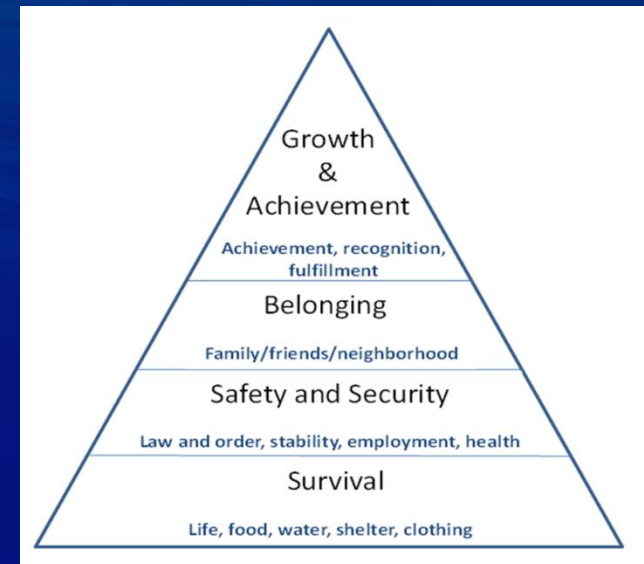
- Business and Services
 - Banking, Health care
 - Utilities
 - Media
- Organizations
 - NGOs (VOAD, Relief)



Step 2. Understand the Situation

Characterize the Social Dimensions

- **Community members**
 - Present and future needs
 - Demographics and economic indicators
 - Social Capital/Social Vulnerabilities
- **Social institutions**
 - Social functions
 - Gaps in capacity
 - Dependencies on other institutions
- **Community metrics**



Characterize the Built Environment

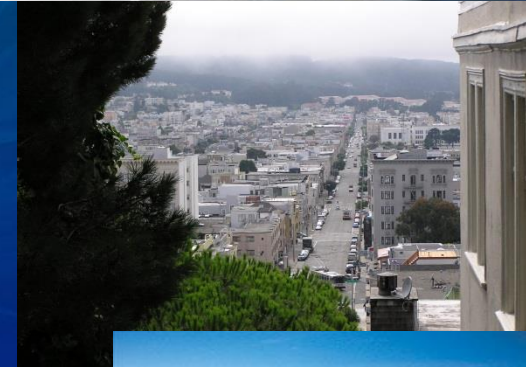
Buildings

Individual structures, including equipment and contents that house people and support social institutions



Building Clusters

A set of buildings that serve a common function such as housing, healthcare, retail, etc.



Infrastructure Systems

Physical networks and structures that support social institutions, including transportation, energy, communications, water and wastewater systems.



Dependencies

Internal and External, Time, Space, Source

Characterize

Location, number, construction, demands and use, etc.



Link Social Dimensions and Built Environment

Some rely more on the built environment



Emergency Rooms



Industrial Plants

Some functions change

Schools → Shelters



Identify how services are supported

- Services provided to meet needs
- Dependency on other services and systems
- Dependency on built environment
- Consequences of loss



Step 3. Determine Goals and Objectives

Establish Long Term Community Goals

- Long term goals to improve the community can guide the prioritization and implementation process.
 - Improve reliability of infrastructure systems
 - Enhance community functions
 - Reduce travel time impacts to residents and businesses
 - Revitalize an existing blighted area
- Community resilience is achieved over time
 - Resilience can be achieved with resources for current maintenance and capital improvements



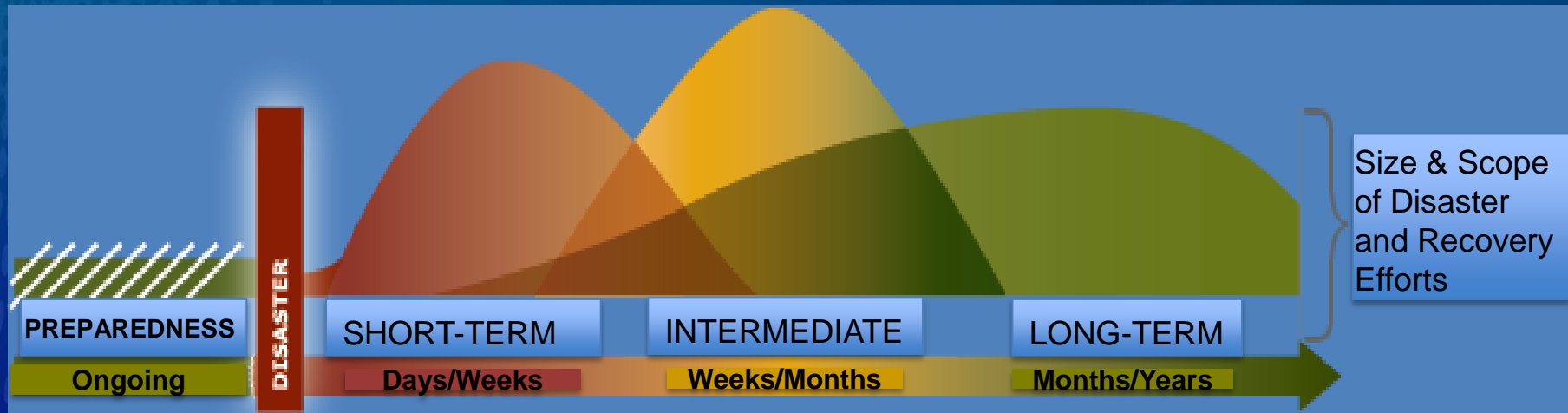
Establish Desired Performance Goals for the Built Environment

- Performance goals are independent of hazard events.
 - Community functions are needed during recovery, such as acute health care, 911 call centers, emergency response
 - Consider role of a facility or system that impacts others outside the community.
- Define goals in terms of '*time needed to restore functionality*'.
- Use goals to help prioritize repair and reconstruction efforts.
- Goals may suggest criteria for new construction and retrofit of existing construction.



Recovery of the Built Environment

Organize around restoring functionality over time



When is each system needed for recovery?



Determine and Characterize Hazards

- Identify prevalent hazards
 - Wind, Earthquake, Inundation
 - Fire, Snow, Rain
 - Human-caused or Technological
- Evaluate hazards for 3 levels
 - Routine Level expected to occur frequently
 - *Should have minimal disruption*
 - Design Level used to design buildings
 - *Anchor for community planning*
 - Extreme Maximum considered possible
 - *Plan for critical services*



Anticipated Performance of Existing Built Environment

- Anticipated performance (restoration of function) during recovery depends
 - Damage level - Condition and capacity of structural and nonstructural systems
 - Recovery time - Materials, equipment, and labor needed for restoration
 - Dependencies on other systems that may be damaged



Hurricane Irene



Hurricane Katrina



Example Summary Resilience Matrix

Infrastructure	Recovery Time								
	Days 0	Days 1	Days 1-3	Wks 1-4	Wks 4-8	Wks 8-12	Mos 4	Mos 4-24	Mos 24+
Critical Facilities									
Buildings	90%							X	
Transportation		90%	X						
Energy		90%	X						
Water			90%		X				
Wastewater				90%				X	
Communication		90%		X					
Emergency Housing									
Buildings									
Transportation									
Energy									
Water					X				
Waste Water									
Communication				90%	X				
Housing/Neighborhoods									
Buildings						90%			X
Transportation			90%	X					
Energy			90%	X					
Water				90%				X	
Waste Water					90%			X	
Communication				90%			X		
Community Recovery									
Buildings								90%	X
Transportation				90%	X				
Energy			90%	X					
Water				90%				X	
Waste Water							90%	X	
Communication				90%			X		

Desired Performance

Anticipated Performance



Superstorm Sandy



Step 4. Plan Development

Evaluate Gaps and Identify Solutions

- **Prioritize gaps**
 - Long-term community goals
 - Social needs during recovery
 - **Identify alternative solutions**
 - Multiple stages
 - Temporary and permanent
 - Administrative
 - Construction
- **Flood plain management**
 - Reduce threat: relocate, elevate
 - **Wind and seismic preparedness**
 - Strengthen: retrofit, redundancy
 - **Recovery Plans**
 - Mutual aid agreements
 - Improvement plans

Infrastructure	Recovery Time								
	Days 0	Days 1	Days 1-3	Wks 1-4	Wks 4-8	Wks 8-12	Mos 4	Mos 4-24	Mos 24+
Critical Facilities									
Buildings	90%								
Transportation	90%								
Energy	90%								
Water			90%						
Wastewater									
Communication	90%								



Prioritize Solutions and Develop Implementation Strategy

- Select solutions for prioritized performance gaps
 - Determine how alternative solutions can be combined to meet community goals.
 - Consider collaborative projects.
- Develop implementation strategies
 - Quantify benefits of impact on public safety and social needs.
 - Evaluate economic impacts on community - costs and savings.
 - Consider short- and long-term benefits versus costs.
- Determine preferred implementation strategy



2013 Mandatory Soft Story Retrofit program for all older, wood-framed, multi-family buildings ensures the safety and resilience of San Francisco.



North Texas 2050 plan integrates land use, natural resources, transportation, housing, water and wastewater infrastructure, parks and open spaces.



Step 5. Plan Preparation, Review, and Approval

Plan Approval

- Document proposed implementation strategy and supporting assessments and solutions.
- Share with all stakeholders and community members
 - Public Meetings, review and comment period
- Finalize and approve community plan.



APPROVED

**Final
Community
Plan:
Implementation
Strategy**



Step 6. Plan Implementation and Maintenance

Implementation

- Formally adopt community plan to guide local government and agencies
- Identify and obtain resources to implement solutions
- Track and *communicate progress* to stakeholders

Plan Maintenance

- Review strategy and solutions on a regular basis
- Modify or update as needed



Planning Guide Outline

Volume 1 - Methodology

Executive Summary

- Introduction
- Methodology and Planning Steps
- Future Directions
- Planning Example – Riverbend, USA
- Glossary and Acronyms

Volume 2 - Reference

Executive Summary

- Social Community
- Dependencies and Cascading Effects
- Buildings
- Transportation Systems
- Energy Systems
- Communications Systems
- Water & Wastewater Systems
- Community Resilience Metrics



Related Activities

- **Community Resilience Panel**
 - Focus on identifying gaps in practice and knowledge
 - Develop supporting guidance and best practices to help users of the Guide.
 - First meeting held November 2015, next meeting Spring 2016
- **Community Use of the Guide**
 - How to best work with communities interested in using the Guide
 - Gather feedback to support revisions to Guide



NIST Contact

Website:

<http://www.nist.gov/el/resilience/>

Guide:

<http://www.nist.gov/el/resilience/guide.cfm>

Or google “NIST Resilience Planning Guide”

General E-mail: resilience@nist.gov



Questions?

